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EXAMINER	
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ART UNIT	PAPER NUMBER
2167	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/608,037	GHEMAWAT ET AL.	
	Examiner	Art Unit	
	KIMBERLY LOVEL	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-11,13,15,16 and 19-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-11, 13, 15, 16 and 19-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This communication is in response to the Amendment filed 1 August 2008.

2. Claims 1, 3-11, 13, 15, 16 and 19-39 are currently pending. Claims 2, 12, 14, 17 and 18 have been previously cancelled. In the Amendment filed 1 August 2008, claims 1 and 3-11 are amended and claims 34-39 are new. This action is made Final.

3. The rejections of claims 1, 3-11, 13, 15, 16, 19-24, 27, 30 and 31 as being unpatentable over US Patent No 7,206,836 to Dinker et al in view of US PGPub 2003/0115218 to Bobbitt et al and claims 25, 26, 28, 29, 32 and 33 as being unpatentable over US Patent No 7,206,836 to Dinker et al in view of US PGPub 2003/0115218 to Bobbitt et al and further in view of US Patent No 5,689,706 to Rao et al have been maintained.

Claim Clarifications - 35 USC § 101

4. The system includes a server which is considered to represent the necessary hardware in order to place the claim in the statutory category of a system. The system includes a processor, which is construed to be hardware since the specification states that the server represents a conventional processor or microprocessor. The master also is construed as including the necessary hardware since it includes a processor according to the specification.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 3-11, 13, 15, 16, 19-24, 27, 30, 31 and 34-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No 7,206,836 to Dinker et al (hereafter Dinker) in view of US PGPub 2003/0115218 to Bobbitt et al (hereafter Bobbitt).

Referring to claim 1, Dinker discloses a file system, comprising:

a plurality of servers [nodes 101A-101C] configured to store file data as chunks [subsets] (see column 3, lines 31-46 and Fig 1A); and

a master [replication topology manager] connected to the servers (see column 5, lines 47-59)

where the master is configured to:

communicate with the servers at startup of the master to identify the chunks [portions of data] stored by the servers, and record, in a non-persistent manner, information regarding the chunks stored by each of the servers as the location (see column 6, lines 8-67).

Dinker fails to explicitly disclose the further limitation wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks, store mapping data that maps the file identifiers to the chunks

to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data, and store location data that identifies which of the servers stores which of the chunks. Bobbitt discloses a virtual file system including a master [master file server] and a plurality of servers (see [0084]), including the further limitation of wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks [file GUID], store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data and store location data that identifies which of the servers [slave location identifier] stores which of the chunks (see [0048] and [0052]-[0054]).

It would have been obvious to one of ordinary skill in that art at the time of the invention to utilize the file system of Bobbitt to store the data chunks of Dinker. One would have been motivated do so in order to increase the efficiency of managing disk space by providing a manner in which additional servers can be added and data can be migrated (Bobbitt: see [0004]).

Referring to claim 3, the combination of Dinker and Bobbitt (hereafter Dinker/Bobbitt) discloses the system of claim 1, where the master is further configured to control placement of new chunks at the servers (Dinker: see column 6, lines 8-49; Bobbitt: see [0081]).

Referring to claim 4, Dinker/Bobbitt discloses the system of claim 3, where when controlling the placement of new chunks, the master is configured to: identify one

or more of the servers to store the new chunks based on at least one of utilization of the servers [Bobbitt: slave with the largest free disk space], prior chunk distribution involving the servers, network topology, or failure correlation properties associated with the servers, and place the new chunks at the identified one or more servers (Dinker: see column 6, lines 8-67; Bobbitt: see [0081], lines 10-14).

Referring to claim 5, Dinker/Bobbitt discloses the system of claim 1, where the master is further configured to control redistribution [data migration] of the chunks stored by the servers (Dinker: see column 6, lines 27-38; Bobbitt: see [0090]).

Referring to claim 6, Dinker/Bobbitt discloses the system of claim 5, where when controlling redistribution of the chunks, the master is configured to: select a chunk to redistribute based on a current distribution of the chunks, identify one or more of the servers to which to move the selected chunk, and move the selected chunk to the identified one or more servers (Dinker: see column 6, lines 8-67; Bobbitt: see [0098]).

Referring to claim 7, Dinker/Bobbitt discloses the system of claim 1, where the master is further configured to monitor a state [status] of the servers [nodes] (Dinker: see column 6, lines 13-16).

Referring to claim 8, Dinker/Bobbitt discloses the system of claim 7, where the master is configured to exchange heartbeat signals with the servers to determine the state of the servers (Dinker: see column 6, lines 13-15).

Referring to claim 9, Dinker/Bobbitt discloses the system of claim 8, where the heartbeat signals include space utilization information [how often each subset of data is accessed] (Drinker: see column 6, lines 40-44).

Referring to claim 10, Dinker/Brin/Rao discloses the system of claim 7, where the state of the servers includes information regarding the chunks stored by the servers (Dinker: see column 6, lines 8-67).

Referring to claim 11, Dinker/Brin/Rao discloses the system of claim 10, where the information includes version numbers of the chunks (Dinker: see column 6, lines 8-67).

Referring to claim 13, Dinker discloses a master in a file system that includes the master connected to a plurality of servers, the mater comprising:

means for communicating with the servers to identify the file data stored by the servers as chunks, and means for storing in a non-persistent manner, location information that identifies ones of the servers that store the chunks (see column 6, lines 8-67).

Dinker fails to explicitly disclose the further limitations of means wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks, store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data, and store location data that identifies which of the servers stores which of the chunks. Bobbitt discloses a virtual file system including a master [master file server] and a plurality of servers (see [0084]), including the further limitations of the means wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks [file GUID], store mapping data that

maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data and store location data that identifies which of the servers [slave location identifier] stores which of the chunks (see [0048] and [0052]-[0054]).

It would have been obvious to one of ordinary skill in that art at the time of the invention to utilize the file system of Bobbitt to store the data chunks of Dinker. One would have been motivated do so in order to increase the efficiency of managing disk space by providing a manner in which additional servers can be added and data can be migrated (Bobbitt: see [0004]).

Referring to claim 15, Dinker discloses a file system, comprising:

a plurality of servers [nodes 101A-101C] configured to store files as chunks [subsets] (see column 3, lines 31-46 and Fig 1A); and

a master [replication topology manager] connected to the servers (see column 5, lines 47-59) and configured to:

determine location information by communicating with the servers, the location information being based on which of the servers stores which of the servers store ones of the chunks [portions of data] (see column 6, lines 8-67).

Dinker fails to explicitly disclose the further limitation wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks, store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data,

store location data that identifies which of the servers stores which of the chunks, store the location information as the location data, and update the location data by periodically communication with the servers to obtain changes to the location data. Bobbitt discloses a virtual file system including a master [master file server] and a plurality of servers (see [0084]), including the further limitation of wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks [file GUID], store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data, store location data that identifies which of the servers [slave location identifier] stores which of the chunks, store the location information as the location data (see [0048] and [0052]-[0054]) and update the location data by periodically communicating [polling for configuration changes] with the servers to obtain changes to the location data (see [0080]).

It would have been obvious to one of ordinary skill in that art at the time of the invention to utilize the file system of Bobbitt to store the data chunks of Dinker. One would have been motivated do so in order to increase the efficiency of managing disk space by providing a manner in which additional servers can be added and data can be migrated (Bobbitt: see [0004]).

Referring to claim 16, Dinker discloses a file system, comprising:

a plurality of servers [nodes 101A-101C] configured to store files as chunks [subsets] (see column 3, lines 31-46 and Fig 1A); and

a master [replication topology manager] connected to the servers (see column 5, lines 47-59) and configured to:

communicate with the servers to determine location information of the data, the location information being based on which of the servers stores which of the servers store ones of the chunks [portions of data] (see column 6, lines 8-67).

Dinker fails to explicitly disclose the further limitation wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks, store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data, store location data that identifies which of the servers stores which of the chunks, and store the location information as the location data. Bobbitt discloses a virtual file system including a master [master file server] and a plurality of servers (see [0084]), including the further limitation of wherein the master is configured to store namespace data that includes file identifiers for files for which the file data is stored as chunks [file GUID], store mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, store an operation log that includes a record of changes to at least one of the namespace data or the mapping data, store location data that identifies which of the servers [slave location identifier] stores which of the chunks, store the location information as the location data (see [0048] and [0052]-[0054]).

It would have been obvious to one of ordinary skill in that art at the time of the invention to utilize the file system of Bobbitt to store the data chunks of Dinker. One would have been motivated do so in order to increase the efficiency of managing disk space by providing a manner in which additional servers can be added and data can be migrated (Bobbitt: see [0004]).

Referring to claim 19, Dinker/Bobbitt discloses the file system of claim 1, where the file identifiers are organized hierarchically in a tree of directories (Bobbitt: see [0009]).

Referring to claim 20, Dinker/Bobbitt discloses the file system of claim 1, where the master stores the namespace data using prefix-compression (Bobbitt: see [0052]-[0054]).

Referring to claim 21, Dinker/Bobbitt discloses the file system of claim 1, where the master is configured to identify one of the chunks via a chunk handle that uniquely identifies the one of the chunks (Bobbitt: see [0054]).

Referring to claim 22, Dinker/Bobbitt discloses the file system of claim 21, where the chunk handle encodes a timestamp (Bobbitt: see [0054]).

Referring to claim 23, Dinker/Bobbitt discloses the file system of claim 1, where the master is configured to update the location data by periodically instructing the servers to provide information regarding the chunks stored by the servers (Dinker: see column 6, lines 8-67).

Referring to claim 24, Dinker/Bobbitt discloses the file system of claim 1, where the operation log includes a logical timeline that defines an order for concurrent operations (Bobbitt: see [0048]).

Referring to claim 27, Dinker/Bobbitt discloses the master of claim 13, where the operation log includes a logical timeline that defines an order for concurrent operations (Bobbitt: see [0048]).

Referring to claim 30, Dinker discloses a method performed by a master in a file system that includes the master device connected to a plurality of server devices, the method comprising:

communicating with the server devices to identify the file data stored by the server devices as chunks (see column 6, lines 8-67).

Dinker fails to explicitly disclose the further limitations of storing namespace data that includes file identifiers for files for which the file data is stored as chunks, storing mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, maintaining an operation log that includes a record of changes to at least one of the namespace data or the mapping data, and storing location data information identifies which of the servers stores which of the chunks. Bobbitt discloses a virtual file system including a master [master file server] and a plurality of servers (see [0084]), including the further limitations of storing namespace data that includes file identifiers for files for which the file data is stored as chunks [file GUID], storing mapping data that maps the file identifiers to the chunks to which the file identifiers correspond, maintaining an operation log that includes a record of changes to at least one of the

namespace data or the mapping data and storing location data that identifies which of the servers [slave location identifier] stores which of the chunks (see [0048] and [0052]-[0054]).

It would have been obvious to one of ordinary skill in that art at the time of the invention to utilize the file system of Bobbitt to store the data chunks of Dinker. One would have been motivated do so in order to increase the efficiency of managing disk space by providing a manner in which additional servers can be added and data can be migrated (Bobbitt: see [0004]).

Referring to claim 31, Dinker/Bobbitt discloses the method of claim 30, where maintaining the operation log includes storing a logical timeline that defines an order for concurrent operations (Bobbitt: see [0048]).

Referring to claim 34, Dinker/Bobbitt discloses the file system of claim 15, where the master is further configured to: identify one or more of the servers to store a new chunk based on prior chunk distribution involving the servers [Dinker: new data may be sent to the node currently storing the least amount of data; load balancing], and place the new chunk at the identified one or more servers (Dinker: see column 6, lines 8-67; column 5, lines 5-6; column 10, line 67 – column 11, line 3; and Bobbitt: see [0081], lines 10-14).

Referring to claim 35, Dinker/Bobbitt discloses the file system of claim 15, where the master is configured to: identify one or more of the servers to store a new chunk based on failure correlation properties associated with the servers, and place the

new chunk at the identified one or more servers (Dinker: see column 6, lines 8-67; see column 6, line 27 – column 7, line 3; and Bobbitt: see [0081], lines 10-14).

Referring to claim 36, Dinker/Bobbitt discloses the file system of claim 16, where the master is further configured to: identify one or more of the servers to store a new chunk based on prior chunk distribution involving the servers [Dinker: new data may be sent to the node currently storing the least amount of data; load balancing], and place the new chunk at the identified one or more servers (Dinker: see column 6, lines 8-67; column 5, lines 5-6; column 10, line 67 – column 11, line 3; and Bobbitt: see [0081], lines 10-14).

Referring to claim 37, Dinker/Bobbitt discloses the file system of claim 16, where the master is configured to: identify one or more of the servers to store a new chunk based on failure correlation properties associated with the servers, and place the new chunk at the identified one or more servers (Dinker: see column 6, line 8 – column 7, line 3; and Bobbitt: see [0081], lines 10-14).

Referring to claim 38, Dinker/Bobbitt discloses the master of claim 13, further comprising: means for identifying one or more of the servers to store a new chunk based on utilization of the servers [Bobbitt: slave with the largest free disk space], prior chunk distribution involving the servers [Dinker: new data may be sent to the node currently storing the least amount of data; load balancing] and failure correlation properties associated with the servers, and place the new chunk at the identified one or more servers (Dinker: see column 6, line 6 – column 7, line 3; column 5, lines 5-6; column 10, line 67 – column 11, line 3; and Bobbitt: see [0081], lines 10-14).

Referring to claim 39, Dinker/Bobbitt discloses the method of claim 30, further comprising: identifying one or more of the servers to store a new chunk based on utilization of the servers [Bobbitt: slave with the largest free disk space], prior chunk distribution involving the servers [Dinker: new data may be sent to the node currently storing the least amount of data; load balancing] and failure correlation properties associated with the servers, and place the new chunk at the identified one or more servers (Dinker: see column 6, line 6 – column 7, line 3; column 5, lines 5-6; column 10, line 67 – column 11, line 3; and Bobbitt: see [0081], lines 10-14).

7. Claims 25, 26, 28, 29, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No 7,206,836 to Dinker et al (hereafter Dinker) in view of US PGPub 2003/0115218 to Bobbitt et al (hereafter Bobbitt) as applied to claims 1, 13 and 30 above, and further in view of US Patent No 5,689,706 to Rao et al (hereafter Rao).

Referring to claims 25, 28 and 32, Dinker/Bobbitt fails to explicitly disclose the further limitation of the log. Rao discloses a replicated files including a log (see abstract), including the further limitations where the master is configured to: determine when a size of the operation log exceeds a threshold, and create a checkpoint of the operation log when the size of the operation log exceeds the threshold (Rao: see column 11, lines 11-34).

It would have been obvious to one of ordinary skill in the art at the time of the invention to monitor the log of Dinker/Bobbitt in the manner disclosed by Rao. One would have been motivated to do so in order to increase the efficiency of the system.

Referring to claim 26, the combination of Dinker/Bobbitt and Rao (hereafter Dinker/Bobbitt/Rao) discloses the file system of claim 25, where the master is configured to: create a new operation log file, and create the checkpoint as a background operation (Rao: see column 11, lines 11-34).

Referring to claim 29, Dinker/Bobbitt/Rao discloses the master of claim 28, where the means for creating the checkpoint includes: means for creating a new operation log file, and means for creating the checkpoint as a background operation (Rao: see column 11, lines 11-34).

Referring to claim 33, Dinker/Bobbitt/Rao discloses the method of claim 32, where creating the checkpoint includes: creating a new operation log file, and creating the checkpoint as a background operation (Rao: see column 11, lines 11-34).

Response to Arguments

8. Applicant's arguments filed in prior art rejections have been fully considered but they are not persuasive.

9. Referring to Applicant's arguments on pages 13-15, the applicant states the following:

> Dinker et al and Bobbit et al, whether taken alone or in any reasonable combination do not disclose or suggest the combination of features recited in

amended claim 1. For example, Dinker et al and Bobbit et al do not disclose or suggest a master that is configured to, among other things, store an operation log that includes a record of changes to at least one of namespace data, which includes file identifiers for files for which the file data is stored as chunks, or mapping data, which maps the file identifiers to the chunks to which the file identifiers correspond, as recited in claim 1.

The Examiner admitted that Dinker et al does not disclose or suggest an operation log, but alleged that Bobbit et al discloses storing an operation log that includes a record of changes to at least one namespace data or mapping data, and cited paragraphs 0048 and 0052-0054 of Bobbit et al for support. Applicants submit that the disclosure of Bobbit et al provides no support for the Examiner's allegation.

The examiner respectfully disagrees. An example of a namespace is a directory. The gtrees of Bobbit are considered to represent a directory of the files. The master contains a copy of each gtree from the servers. Bobbit deals with the migration of files, which means that files are being moved from one server to another server. Thus, when the files are migrated, their namespace data and mapping data are both updated at the master. For further explanation, see paragraph [0093] of Bobbit. Therefore, the structures of Bobbit are considered to meet the requirements of the operation log.

10. Referring to Applicant's arguments on pages 15-17, the applicant states "Dinker et al and Bobbit et al, whether taken alone or in any reasonable combination, also do not disclose or suggest a master that is configured to, among other things,

communicate with the servers at startup of the master to identify the chunks stored by the servers and record, in a non-persistent manner, information regarding the chunks stored by each of the servers as the location data, as further recited in claim 1.

The examiner respectfully disagrees. Replication topology managers [i.e., masters] are located on different nodes. The communication interface may notify replication topology manager 160 whenever changes in cluster membership are detected. Therefore, it is inherent that when a node, which is to become a manager is added to the cluster, the node will have to receive the topology information. Thus, Dinker is considered to meet the requirements of the claimed limitation.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KIMBERLY LOVEL whose telephone number is (571)272-2750. The examiner can normally be reached on 8:00 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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